CHILD TRACKING SYSTEM USING GPS AND ARDUINO

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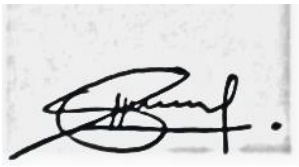

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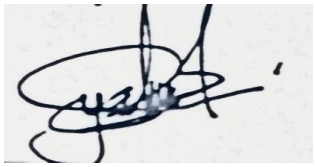

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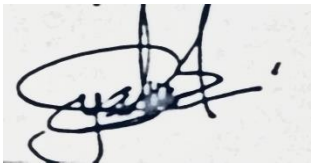

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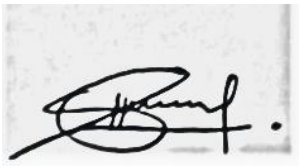

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ABSTRACT

Child Tracking System using GPS and Arduino was developed to help parents in monitoring their children and hence, reduce the number of missing child cases in Malaysia. This system will involve the uses of GPS (Global Positioning System), GSM (Global System for Mobile Communication), vibration tilt sensor, and Arduino Uno Microcontroller. In this application, GPS will help to determine coordinates of the child's location in latitude and longitude with the help of Google maps directly to parents's smart phone. Then, GSM will send the child's location to parent's smart phone via Short Messaging System (SMS). An application will be developed for this project to allow parents to view their child current location using their smart phone. In this project, the vibration tilt sensor which is embedded in the child's smart watch will detect the shaking or struggle of their child to ensure the safety of the child. The vibration tilt sensor will measure the bandwidth of vibration and send shaking's signal to Arduino Uno Microcontroller. Then, the Arduino Uno Microcontroller will send alert message to Parent according to the amount of bandwidth of shaking's signal received from vibration tilt sensor. Hence, the parent would be notified by the condition of their child whether they are safe or not. The methodology used in this project development is using Rapid Application Development (RAD). This Child Tracking System will be developed by using the mobile application systems that need to be installed by the user especially parents and it will be connected to the prototype of smart watch for child.

ABSTRAK

Sistem Penjejakan Kanak-Kanak menggunakan GPS dan Arduino telah dibangunkan untuk membantu ibu bapa dalam memantau anak-anak mereka dan dengan itu mengurangkan jumlah kes kanak-kanak yang hilang di Malaysia. Sistem ini akan melibatkan penggunaan GPS (Global Positioning System), GSM (Global System for Mobile Communication), sensor kecondongan getaran dan Arduino Uno Microcontroller. Dalam aplikasi ini, GPS akan membantu menentukan koordinat lokasi kanak-kanak di latitud dan longitud dengan bantuan peta Google terus ke telefon pintar ibu bapa. Kemudian, GSM akan menghantar lokasi kanak-kanak ke telefon pintar ibu bapa melalui Sistem Pesanan Ringkas (SMS). Permohonan akan dibangunkan untuk projek ini untuk membolehkan ibu bapa melihat lokasi semasa anak mereka menggunakan telefon pintar mereka. Dalam projek ini, sensor kecondongan getaran yang tertanam dalam jam pintar kanak-kanak akan mengesan gegaran atau perjuangan anak mereka untuk memastikan keselamatan kanak-kanak itu. Sensor kecondongan getaran akan mengukur jalur lebar getaran dan menghantar isyarat gemetar ke Mikrokontroller Arduino Uno. Kemudian, Mikrokontroler Arduino Uno akan menghantar mesej amaran kepada Ibu Bapa mengikut jumlah jalur lebar isyarat goncangan yang diterima daripada sensor kecondongan getaran. Oleh itu, ibu bapa akan dimaklumkan oleh keadaan anak mereka sama ada mereka selamat atau tidak. Metodologi yang digunakan dalam pembangunan projek ini menggunakan Pengembangan Aplikasi Rapid (RAD). Sistem Penjejakan Kanak-Kanak ini akan dibangunkan dengan menggunakan sistem aplikasi mudah alih yang perlu dipasang oleh pengguna terutama ibu bapa dan ia akan disambungkan kepada prototaip jam pintar untuk kanak-kanak.

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LIST OF ABBREVIATIONS

GPS	Global Positioning System
GSM	Global System for Mobile Communication
IDE	Integrated Development Environment
IOS	Internetwork Operating System
RAD	Rapid Application Development
SMS	Short Messaging System
SDLC	Software Development Life Cycle
WIFI	Wireless Fidelity

CHAPTER 1

INTRODUCTION

1.1 Introduction

Over the years our country, Malaysia has been bombarded with abundance of abduction or missing child cases. Based on police statistics, a total of 2015 children was reported missing in 2014, 1782 cases reported in 2015 and 1803 cases reported in 2016 (Times, 2017). Furthermore, based on the latest statistics, Malaysian police reveals that on average, a total of four children go missing every day in our country (Star, 2017). There were 723 cases of missing children have been recorded in just the first six months of 2017 which is about 181 days. Of the 723 cases, 447 were girls and 276 were boys. It is so sad to acknowledge that 345 cases of missing children have been successfully found, while 378 are still missing. The data was collected until June, 2017, thus the abduction or missing child cases will keep on happen. This show that how serious of our country on the abduction or missing child cases (Online, 2017).

Moreover, child abduction is an alarming and life changing event that has terrified many children's, parents and love ones. Child abduction is every parent's worst nightmare. It could happen in anywhere such as in the playground, theme park, shopping malls, yard or even their child's school. The terrifying truth is that child abduction could happen almost anywhere in the world. Hence, it is important for parents to take care of their own child. They need to make sure their child is safe when going out to anywhere at all time despite of their busy working day.

Monitoring child's activities is not an easy job for parents especially when they are not with their child such as working and outstation. In order to solve this problem, I have proposed a child tracking system that would help parents to monitor their child from remotely. The child tracking system with smart watch would help parents to monitor the safety of their child by having an interaction with them in real-time communication using the mobile application and system that need to be installed by parents and their child with internet connection. Parents need to install the child tracking system in their smart phones meanwhile their child just need to wear the smart watch in order to interact with each other. The child tracking system with smart watch would features GPS tracking that will allow parents to view the location of their child at any time. Parents can stay connected with their child by using the child tracking system with smart watch as it is easy to use, convenience and save a lot of time. Therefore, the child tracking system with smart watch is the best solution for parents to monitor their child from remotely.

1.2 Problem Statement

There are three problem statement that is identified which is many cases of missing children, less implement of smart watch with GPS tracking features in Malaysia and high cost of existing child tracking system.

i. Back in the day, child tracking devices do not exist. Parents usually are almost helpless when their child is lost. They need to rely on the police and the community to give them the good news. Therefore, when there is no child tracking system, the parents are unable to detect when their child wander off and leaves the safe zone. Besides, the parents are also unable to interact with their child when they are working or away from their child. As a result, when there is no child tracking system, parents are unable to know when their child is in an emergency situation. They also cannot interact and monitor their child in a quick time.

ii. Apart from that, other problem that arise is less implement of smart watch with GPS tracking features in Malaysia. According to my research, I have

found that the smart watch with GPS tracking features is less implemented in Malaysia compared to other developed countries such as United State of America (USA) and United Kingdom (UK). So, it is important to develop the child tracking system that have suitable features in Malaysia. Moreover, without the child tracking system, the parents could not identify the exact location of child when they lost track of their child in crowded places such as playground, theme parks and beaches. Thus, it is hard for parents to monitor the safety of their child at all time from remotely.

iii. Lastly, the identified problem is high cost of smart watch with GPS features tracking. Other countries especially the developed countries such as United State of America (USA) and United Kingdom (UK), they do import their product of smart watch for child to another country but it will require a high cost for Malaysians to buy. Even though their product offers a smart watch for child with more advanced features, it requires a high cost for the user from other countries to buy. On the other hand, the proposed system, child tracking system will offer user a smart watch for child with the necessary features and with a lower cost. In addition, by just using the smart watch to monitor their child safety allow the child more freedom while being watched.

All of these problem statement can be summarized as shown in the Table 1:

Table 1 Problem in Monitoring Child Safety

No	Problem	Description	Effect
1	Many cases of missing children	During emergency, parents unable to get instant response. Parents also unable to interact with their child when they are working	Parents unable to know when their child is in an emergency situation. They also cannot interact and

		or away from their child.	monitor their child in a quick time.
2	Less implement of smart watch with GPS tracking features in Malaysia	Smart watch with GPS tracking features is less implemented in Malaysia compared to other countries.	It is hard for parents to monitor the safety of their child at all time from remotely.
3	High cost of existing child tracking system	Other countries do import their product of smart watch for child to another country but it will requires a high cost for Malaysians to buy.	The high cost of existing child tracking system will not be affordable to all people in Malaysia.

1.3 Objectives

i. To study and get information about the existing child tracking system.

ii. To develop a prototype of smart watch for child using vibration tilt sensor which is used for shaking detection of child.

iii. To design and evaluate a new system to detect exact children's location with current coordinate by using GPS technology and an android mobile application that is user friendly and easy to use for parents in order to monitor their child's safety.

1.4 Scope

i. The system is suitable for outdoor areas only and it will focus on invention of smart watch that is wearable for the child and child tracking system which can be installed on parents' smartphones in order to monitor their child's safety at all time.

ii. The child tracking system will use GPS (Global Positioning System) module as the tracking system tools and GSM (Global System for Mobile Communications) to send notification message to other people, Arduino Uno Microcontroller, vibration tilt sensor, embedded system, mobile device, and Wi-Fi technology to detect the exact children's location.

iii. The child tracking system will be developed by using the mobile application systems that need to be installed by the user and it will be connected to the prototype of smart watch for child.

1.5 Significance

i. The child tracking system would help parents to monitor their children's safety from remotely when they are working or going for a summer vacation or weekends by using their smartphones and wearable smart watch for their children.

ii. The child tracking system would improve the effectiveness in detect the exact location of the children in real-time using the GPS technology.

iii. The child tracking system is also easy and convenience to use by both parents and their children as it provides the ability to interact with each other in a real-time communication.

1.6 Thesis Organization

This thesis consists of five chapters that will cover from the beginning of the process until the end. Chapter 1 is discussing about the introduction or the overview of the system. It will focus on project introduction including problem statement, objective, scope, significance and thesis organization.

Chapter 2 is the study of literature review which requires student to do some research about the related topic. This chapter describe in detail about the existing system, method, techniques, hardware or technologies that will be implemented for the project.

Chapter 3 is discussing about the methodology use for the overall framework of the project. It will describe the method and technique that has been used to design and develop the project. This chapter also illustrate approach used for the system and describe the requirement of hardware and software.

Chapter 4 is discussing about the performance, testing and the analysis on the results of the project. Furthermore, this chapter will emphasize on implementation process for software and hardware that is used in this project. The User Acceptance Test (UAT) is also essential in this chapter.

Chapter 5 is the final chapter of this project which will discuss the brief explanation of the developed project. This chapter will conclude the overall chapters that have been studied and discussed in the project. In addition, students also need to describe all the constraints during the development process and suggest ideas to improve the system in upcoming work.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The main purpose of Child Tracking System by Using GPS and Arduino is to develop a device that allow parents to monitor exact location of their children from remotely in real-time. The main components of this project are Global Positioning System (GPS), Global System for Mobile Communications (GSM) and Arduino as the tracking system tools with a mobile application for the system. Basically, in order to use this system, parents need to install the child tracking system's mobile application on their smartphones meanwhile the children just need to wear smart watch which has GPS features.

After installation has been done, the parents can start monitor safety and track the location of their child from their smartphone. The GPS and GSM technologies are really useful in tracking a missing child. There are two major services used for this system which is GPS and GSM. GPS provide the location services meanwhile GSM provide telephony services. GSM is used for communicating between parent side and child side.

Furthermore, parent side will use GPS and GSM service for connecting to child's smart watch and with the help of Google maps, they able to view current location of the child. On the other hand, child side uses GSM services to communicate with parent side. At child side, GPS works as location services and the parent side uses internet connectivity and GPS to view the exact child's location on the map.

2.2 Development Tools

This section will discuss about the development tools which consists of hardware and software that will be used to develop this project.

2.2.1 Global Positioning System (GPS)

GPS is a satellite navigation system that allows us to determine the exact location of an object (longitude and latitude) by calculating the time difference for signals from different satellites to reach the receiver. The GPS system includes 24 satellites deployed in space about 12,000 miles (19,300 kilometres) above the earth's surface. Today, GPS receivers are included in many commercial products, such as automobiles, smartphones, exercise watches, and GIS devices. The satellite transmits data through signals and these pieces of information are then received by a GPS receiver. Hence, by using the information sent, the GPS device will then determine the exact and latest location of the user ("Global Positioning System (GPS) Definition," n.d.).

GPS will get the latest information about the location of the children being monitored with the help of Google maps directly to user's mobile phone. In addition, GPS does not require any monthly or annual fees to any party of GPS service provider. So, user can use the GPS services for free of charge.

2.2.2 Global System for Mobile Communications (GSM)

GSM is a leading digital cellular system, which digitizes and compresses data, then sends it down a channel with two other streams of user data, each in its own time slot. GSM supports voice calls and data transfer speeds of up to 9.6 kbps, together with the transmission of Short Message Service (SMS) (Rouse, 2007). GSM offer telephony services which is used for communicating between child side and parent side. Parent side will use GSM service for communicating to child's smart watch and Google Map to view the location of the child on the map. Meanwhile, the child side uses the GSM for communicating with the parent side and location services, GPS to get the location of the

child in form of coordinates. In order for the system to work, telephony and location services must be enabled and up running on the child side.

2.2.3 Arduino

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs such as light on a sensor, a finger on a button, or a Twitter message. Then, it also able to turn the inputs into an output such as activating a motor, turning on an LED, publishing something online. The Arduino Uno microcontrollers are basically programmed using the programming languages C and C++. The Arduino programming language (based on Wiring), and the Arduino Software (IDE), based on Processing can be used in order to send a set of instructions to the microcontroller on the board (Banzi, Cuartielles, Igoe, Martion, & Mellis, 2012).

2.3 Existing Systems

There have been different kinds of child tracking system implemented in most of the country. The research has been made to analyse the different business model provided by different system. There are several kids' smart watch that have similarities in the GPS system in the market. Below is example of the system of safety watches.

2.3.1 HereO 2 GPS Watch for Kids ("hereO, the first GPS watch designed for kids," n.d.)

Figure 2.1 HereO 2 GPS Watch for Kids
Source : ("hereO, the first GPS watch designed for kids," n.d.)

The HereO 2 GPS watch is the world's smallest real-time connected GPS tracking device specifically designed for children ("hereO World's First GPS Watch Designed for Small Children _ Flex," n.d.). The HereO 2 GPS watch is the only location device 100% custom-made for children. The watch is complimented by a variety of colourful designs, every component on board has been miniaturized to ensure an optimally comfortable fit and feel that kids simply love to wear. The HereO 2 GPS watch consists of GPS chip with built-in geo-fencing capabilities. It also used combination of advanced WIFI triangulation algorithms technology that allows for highly accurate location information both outdoors and indoors while maintaining extended battery life.

It is also built in micro USB connector which enable the watch to easily be charged on the go as well as receive latest firmware upgrades from the convenience of their home.

The HereO 2 GPS watch comes equipped with a built-in SIM card supporting connectivity in over 120 countries. There is no need to change sim card when travelling with the Hereo 2 GPS watch, no contracts to sign, and service can be deactivated and re-activated at any time. Furthermore, The HereO 2 GPS watch also has the user-friendly smartphone app to track family location. It will able to check the family member's current and historic location. It also will set safe-zones for family members that using this hereO Family App. Then, the HereO will automatically sends alert and exact location of child to family members using HereO Family App when a panic alert is triggered from this watch.

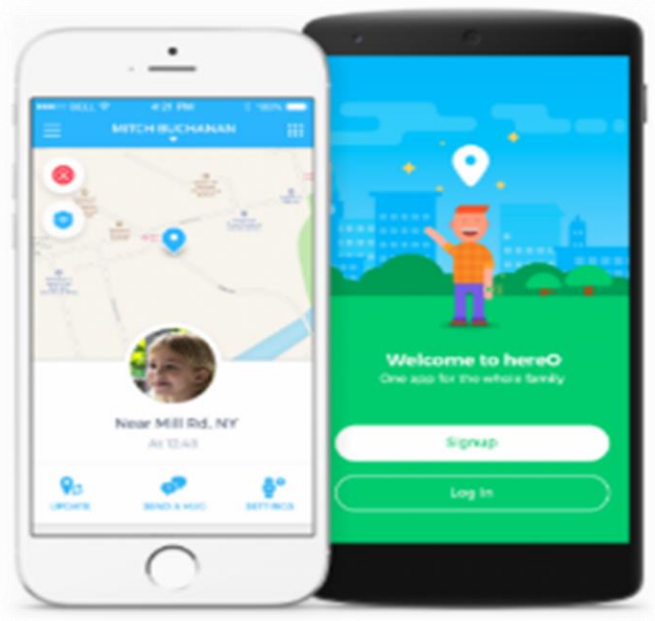

Figure 2.2 HereO Family App

Source : ("hereO, the first GPS watch designed for kids," n.d.)

2.3.2 **KIGO Watch** (“KiGO Watch _ GPS Kids Tracker,” n.d.)

Figure 2.3 KIGO Watch
Source : (“KiGO Watch _ GPS Kids Tracker,” n.d.)

KIGO watch is a brilliant combination of GPS System, GSM System and Wi-Fi to track exact location information for both indoor and outdoor area.

First function of this watch is that it will always connected with GPS or Wi-Fi to locate the position inside and outside of buildings. KIGO watch has an integrated SIM-on-chip, so the user does not need to buy or change the SIM card when travel abroad. In addition, it provides the worldwide to cover connectivity almost everywhere.

Besides, the KIGO watch also provide wrist detection. A small light sensor was built in inside of the watch. The notification will be send immediately via the Loox application installed on smart phones once the watch is taken off. KIGO watch also resists water until a maximum depth of 3 meters.

Another function of KIGO watch is it provide emergency alert. When the alarm on the KIGO is activated, the user immediately will be notified via the Loop application with a loud alarm sound and the accurate location of the KIGO will be shown. KIGO also allow easy messaging. Messages can be send from smart phone and the KIGO using Loox application.

2.3.3 **The FiLIP 2** (“FiLIP - The World’s First Smart Locator and Phone For Kids,” 2016)

Figure 2.4 The FiLIP 2

Source : (“FiLIP - The World’s First Smart Locator and Phone For Kids,” 2016)

The FiLIP 2 is a multi-functional phone, locator and digital watch designed specifically for children to help keep kids safe. The FiLIP 2 watch uses a smart combination of GPS, GSM and Wi-Fi to allow parents to locate their child with the exact location information for indoors and outdoor.

The FiLIP 2 watch has colourful wristwatch design which is fun for kids to wear and it gives parents the extra peace of mind knowing their child would not easily lose their device. In addition, the wristwatch also allow kids to wear their FiLIP 2 securely closed or open and the size can be adjusted as they grow. This watch also provide time and date display for the child to have fun learning to tell time with both numbers and spelled out words.

The FiLIP 2 watch is controlled by an IOS or Android Application that provides parents an easy and intuitive way to set up and manage the device. With the FiLIP mobile application, the parents and caregivers can control their child’s watch such as, add contacts, manage safe zones, send voice and text messages, monitor their location and call them. FiLIP 2 watch also provide voice calling features. It allow two-way voice calls using the built-in speakerphone. Parent can also create a contact list with up to five preprogrammed phone numbers by using the FiLIP application. The FiLIP 2 watch also provide red button for the child when they are not safe or in an emergency state.

2.3.4 Child Tracking System using GPS and Arduino

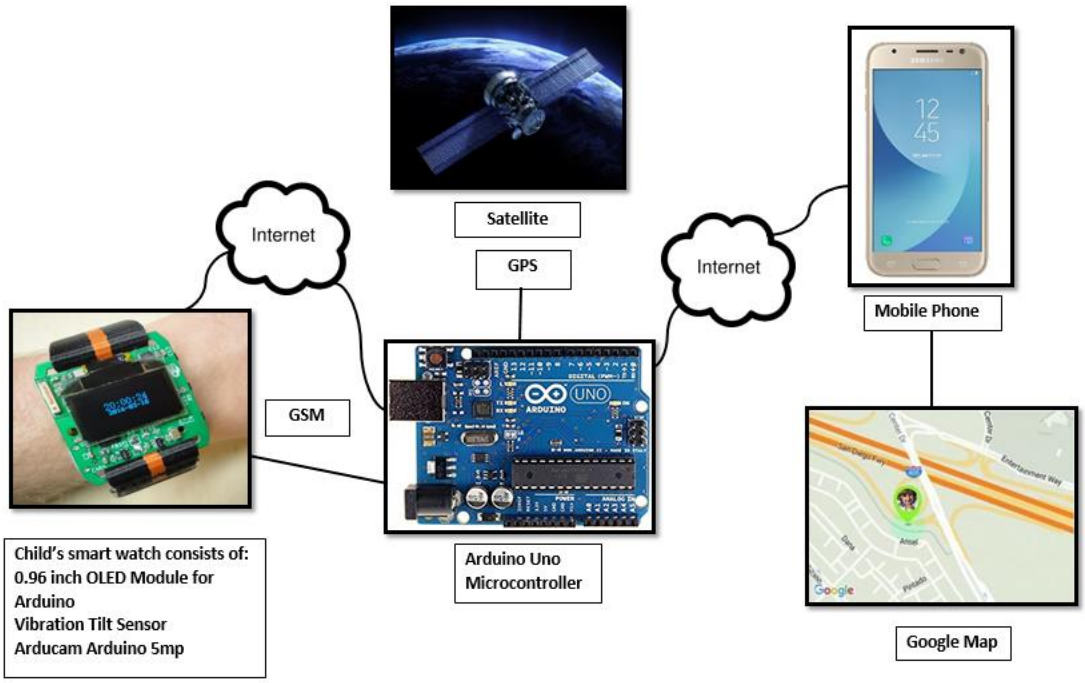

Figure 2.5: Child Tracking System using GPS and Arduino

The proposed system is Child Tracking System using Global Positioning System (GPS) and Arduino. Based on Figure 2.5, the system works on two modules, first for parents and the second one is for children. Parents need to install the Child Tracking System's mobile application on their mobile phone meanwhile their children just need to wear smart watch which has GPS features and shaking detection features. Besides, parents can view the current location for their child using Google Map in Child Tracking System's mobile application with the internet connection.

The Smart watch in this Child Tracking System will uses a smart combination of GPS, Global System for Mobile Communication (GSM) and Wi-Fi which enable the parents to monitor and track the location of their child with accurate information for outdoors area in real time. The GPS will help to send coordinates of the child's location in latitude and longitude. Then, the GSM will send the child's location to parent's mobile phone via notification message or SMS. Finally, the parent will immediately get notified about their children's current location.

2.3.5 The Comparison Between HereO 2 GPS Watch, KIGO Watch, FiLIP 2 Watch and Child Tracking System Using GPS and Arduino

Table 2.1 shows the comparison between three existing system which are HereO 2 GPS Watch , KIGO Watch and FiLIP 2 Watch and Child Tracking System Using GPS and Arduino. These four systems have been compared with types of application, target user, positioning technique, types of detection, types of notification detection, the scope range, support in Malaysia, advantages and disadvantages.

Table 2.1: Comparison between existing system and the proposed system

	HEREO 2 GPS WATCH	**KIGO WATCH**	**FiLIP 2 WATCH**	**CHILD TRACKING SYSTEM USING GPS AND ARDUINO (PROPOSED SYSTEM)**
TYPES OF APPLICATION	• GPS Watch	• GPS Watch	• GPS Watch	• GPS Watch
TARGET USER	• Kids	• Kids	• Kids	• Kids

POSITIONING TECHNIQUE	• Wi-Fi • GSM • GPS	• Wi-Fi • GSM • GPS	• Wi-Fi • GSM • GPS	• Wi-Fi • GSM • GPS
TYPES OF DETECTION	• Detection of the area	• Detection on once the watch is taken off	• Detection of the area	• Detection on once the watch is taken off
TYPES OF NOTIFICATION DETECTION	• SMS Notification	• SMS Notification	• SMS Notification	• SMS Notification
THE SCOPE RANGE	• Indoor and outdoor	• Indoor and outdoor	• Indoor and outdoor	• Outdoor
SUPPORT IN MALAYSIA	• Yes	• No	• No	• Yes
ADVANTAGES	• It has a tamper alert feature that notifies all family members when the device is removed and an additional lock feature for children prone to removing the device.	• Enable parent to always stay connected with their child. • It has an integrated SIM-on-chip, so the user does not need to buy or change the SIM	• FiLIP can make and receive calls from up to 5 pre-set contacts. • Send one-way text messages to child's FiLIP watch. • Receive notifications when	• The Child Tracking System is low cost compared to others. • Provide view current location features to help parents monitor

	• User can use the hereO application for real-time updates of child's location. • It has the built-in SIM card which uses cell phone towers of all carriers, so parents can always keep track of their child. • Waterproof • Extended battery life of up to 48 hours between charges.	card when travel abroad. • Can activate alerts notification. • Easy to set up and sync with the application to start tracking. • Waterproof.	the child enters and leaves a safe zones. • FiLIP allow calls, records and communicates location to 5 contacts.	their child in real time. • This system also has shaking detection features that will predict the safety condition of their children.
DISADVANTAGES	• Customer Service is not good as it offers limited warranty.	• Has limited Loox Application features such as no geo-fencing.	• The watch is water-resistant but not waterproof.	▪ Not waterproof. ▪ Can only be used for outdoor areas.

Based on Table 2.1, it shows the comparison of the three existing systems with my proposed system, Child Tracking System. Basically, all of four system describe in the Table 2.1 have some similarities which is GPS watch that would help parents to track their child's location at anywhere and anytime. Then, all of the four system also use the same technology which is GPS, GSM and Wi-Fi. Apparently, the three existing systems have more features and advantages than my proposed system. However, the three existing systems is not produce in Malaysia, it is implemented in other developed countries such as United State of America (USA) and United Kingdom (UK). So, my proposed system, Child Tracking System will have a basic feature that would help parents to track the location of their child. The features that are provided by the proposed system is can view current location of child and shaking detection for the child. All of this features will be enough and helpful for the users especially parents to track location of their child and allow them to stay connected in real time. Besides, my proposed system offers a lower cost than the other three existing systems which is affordable for the parents in Malaysia to buy. Hence, the proposed system, Child Tracking System is more easy and simple to use with affordable price for the client or user.

2.4 Comparing Hardware / Technology / Tools

This section will compare the hardware, technology, and tools used by the three existing systems and the proposed system, Child Tracking System.

2.4.1 Systems

All of these four smart watch using GPS system to track location, GSM system to send SMS notification and to make a phone call. In addition, all of these four smart watch uses a smart combination of GPS, GSM and Wi-Fi to help parents locate their child both indoors and outdoors. Besides, each of these four smart watch has their own advantages and disadvantages.

2.4.2 Technology

The technology that use in the HereO 2 GPS Watch , KIGO Watch and FiLIP 2 Watch and the proposed system, Child Tracking System is mobile application via smartphones. In order to ease child's location tracking, these four smart watch need to be connected to mobile application which is installed in parents' smartphone. Besides, this mobile application is a native mobile application which is developed to be compatible with any platform such as Google's Android, Apple's IOS, Windows Phone and others.

2.4.3 Tools

All of the existing systems and the proposed system consists of security elements which is alert system since the four smart watch were built for child's safety purpose. Basically, the three existing system which is HereO 2 GPS Watch , KIGO Watch and FiLIP 2 Watch will provide emergency button which will allow child to send emergency alert to the parent. Parent will easily get notification message by using the emergency mode features. On the other hand, the proposed system, Child Tracking System use the vibration tilt sensor to detect the shaking or struggle of the child to ensure the safety of the child. Hence, parents will immediately get alert message when their child is in danger.

CHAPTER 3

METHODOLOGY

3.1 Introduction

Software Development Life Cycle (SDLC) is a conceptual model used in project management that provides a systematic process for building and developing software applications from beginning to completion. It describes the stages involved in an information system development project, from an initial feasibility study on how to develop, maintain, replace and alter or enhance a specific software until the completion of software application. There are various SDLC methodologies that have been developed to guide the process involved such as Waterfall model (which was the original SDLC method), Agile Methodology, Rapid Application Development (RAD), the Spiral model, Extreme Programming and others. In this project, Rapid Application Development (RAD) methodology will be use. All the data in Chapter 1 and Chapter 2 are collected and analysed before implemented into Chapter 3.

Using RAD as a methodology has its own advantages and it is also helpful and very flexible to use. The working prototype is constructed and delivered by the developments that is time boxed. Thus, customer can quickly give feedback when they are using the software or system regarding the performance and their requirements. In RAD, the system work by reuse the prototype consequently, reduce the duration of time of developing process and testing. Apart from reduce time, the quality of the project also increases if its component is highly reusable. Moreover, minimal maintenance cost of system will be offered by using this methodology. In order to improve the good quality of final product, it also require involvement of user in the analysis and design stage (Rad, Development, & Application, 2015).

3.2 Rapid Application Development (RAD)

RAD methodology refers to a development life cycle designed to develop a project in a short time and faster but in higher quality system than the traditional life cycle. It is designed to take advantages of powerful development software like prototyping tools, CASE tools and code generators. RAD methodology focuses on developing applications in a high speed, high quality and low cost system. RAD is a software development methodology that uses minimal planning in favour of rapid prototyping. RAD emphasizes on gathering customer requirements, early testing of the prototypes by the customer using iterative concept, reuse of the existing prototypes (components), continuous integration and rapid delivery.

Methodology are embraced by organization will be consistent with the general management style. RAD methodology is very flexible and adjustable to be change, therefore, it is very ideal for this kind of project since this project require a short period of time to accomplish (Automated Architecture, 2005). Figure 3.1 below describes the phases in Rapid Application Development (RAD) methodology ("10 Top Programming Methodologies," n.d.).

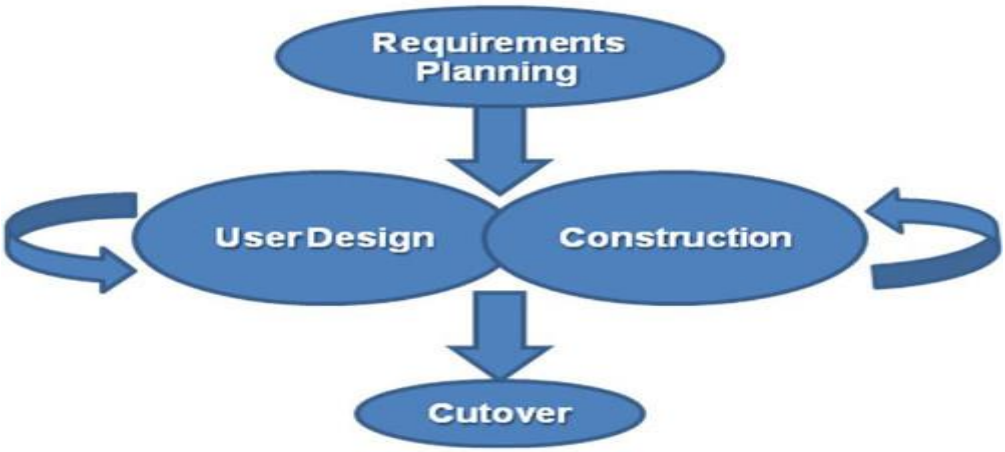

Figure 3.1 Phases in the James Martin approach to RAD

Now, the phases involved to develop this system in this methodology will be discuss in detail.

Phase 1: Requirement Planning Phase

The aims of requirement planning phase is to know about the problems of the current systems. The planning process are taken place before the analysis. In this stage, the scope of the system, objectives and studies of the existing system for the project are determined. The project planning takes place in this stage to determine how this project are going to develop precisely. The requirement planning phase commence with a number of comparing existing system. By comparing the existing system, the requirements that they overlooked or not utilized in the system can be analysed. In order to attain user expectation on the system, it must meet all of these requirements (Rad et al., 2015).

Phase 2: User Design Phase

The purpose of this phase is to illustrate the system's design. All the application's data and processes will be analysed in this phase. A prototype of the proposed system will also be created in this phase. There will be a context diagram, use case diagram, propose user interface, general architecture and package module. All these diagrams are important for user or client to know more about the working of the system. The user or client will easily understand the system flows by modelling the diagram and thus the probability of making changes to the requirement will be reduced (Rad et al., 2015).

Phase 3: Construction Phase

This phase begins instantly after the completion of system design phase. The aim of this phase is to prepare the coding for the whole system and create the prototype of the system as a real working system. In order to build the working prototype of child tracking system, various RAD tools are used in hardware development such as the structure or design of the Arduino board with other component and software development such as user interface. Then, it is checked to verify the functionality developed in order to fulfil the user requirement of the system. This phase is really time consuming to complete successfully when compared with the other phases. This phase will be finished when the programming part of the system is successfully run without any errors or failures and physical part of the system is completed (Rad et al., 2015).

Phase 4: Cutover Phase

This phase reassembles the final tasks in the Software Development Life Cycle (SDLC) implementation phase. This project will involve the process of include data conversion, system testing, change over to the new system and user training. Every unit or components will be examined and the product should meet the client's requirements. Moreover, it also includes the system testing process to fixing any defects found. The user acceptance test will be performing by the client in order to verify the system is accomplish based on client requirement. The system can be deployed to the client side when the system is tested and free from any error. The final result of this phase will build, implement and arrange a new system in better performance ("The Four Phases of RAD | RAD approach," 2017).

3.2.1 Planning

In this phase, it focused on what is the project planning and how to initiate the process to ensure the system will be in a good flow on planning. Hence, it is important to determine the software and hardware that will be used for this project.

In this project, it will use Arduino Uno Microcontroller as a microcontroller, Vibration Tilt Sensor to detect shaking that is triggered from child's smart watch, GPS Module to track the location of the incident happens, 0.96-inch OLED Module for Arduino to display data information and GSM module for send the SMS notification to parent's mobile phone.

Table 3.1 shows the planning on budget for this project. The budget will not exceed RM 500.

Table 3.1 : The planning budget for this project

Device	Quantity	Price (RM)
Arduino Uno Microcontroller	1	40.00
GPS Module GY-NEO6MV2	1	53.00
SIM900 GPRS/GSM Shield	1	150.00
Vibration Tilt Sensor	1	30.00
0.96 inch OLED Module for Arduino	1	24.00
BreadBoard	1	5.00
Jumper wire	40	8.00
Male Header	2	1.60

Power Supply Adapter	1	18.00
GSM Battery	2	20.00
Prepaid Reload	1	10.00
TOTAL		RM 359.60

3.2.2 Analysis

The analysis phase is really important to stage to analyse all the data and information gathered from the previous Chapter 1 and Chapter 2. The main focus of this project is about the microcontroller programming itself. The title of this project is Child Tracking System. The project is proposed after the problems have been identified which is the increasing number of missing children cases. Then, the existing Children Tracking System has also been analysed. All equipment and processes are also identified during this phase.

Since this project used Arduino Uno Microcontroller, GPS Module GY-NEO6MV2, SIM900 GPRS/GSM Shield, Vibration Tilt Sensor and 0.96-inch OLED Module for Arduino, there are several steps that developer should know before develop the system in order for the project running well without any error. The things that need to be analyse are:

i. The connection between Arduino Uno Microcontroller with GPS Module GY-NEO6MV2 and SIM900 GPRS/GSM Shield.

ii. The connection between Arduino Uno Microcontroller with Vibration Tilt Sensor and 0.96-inch OLED Module for Arduino.

iii. The programming language that is used for implementation in this system.

Hence, it is crucial to make sure all the device and the equipment is working properly without any error as the time consuming to complete this project will be affected due to inaccurate decision.

3.2.3 Design

This phase started by designing the system. All the application's data and processes is figured out in this phase. There will be a context diagram, use case diagram, propose user interface, general architecture and package module. By modelling the diagram, client or user will easily understand the system flows and it will reduce the probability of making changes to the requirement. It will allow the developer to build, implement and test the system. This phase is also important to ensure that all the design follows the requirement of the user.

3.2.3.1 Context Diagram

Context diagram is an outline used to define boundaries between the system, the framework and their environment. For this situation, Child Tracking System is developed to allow parents to track their child's location from remotely in real time by using the mobile android application. Thus, the user especially parents will be able to view current location, make phone call or video call and manage safe zones for their children. The system also will send alert messages to parents when shaking detection is triggered by vibration tilt sensor that will be embedded in child's smart watch.

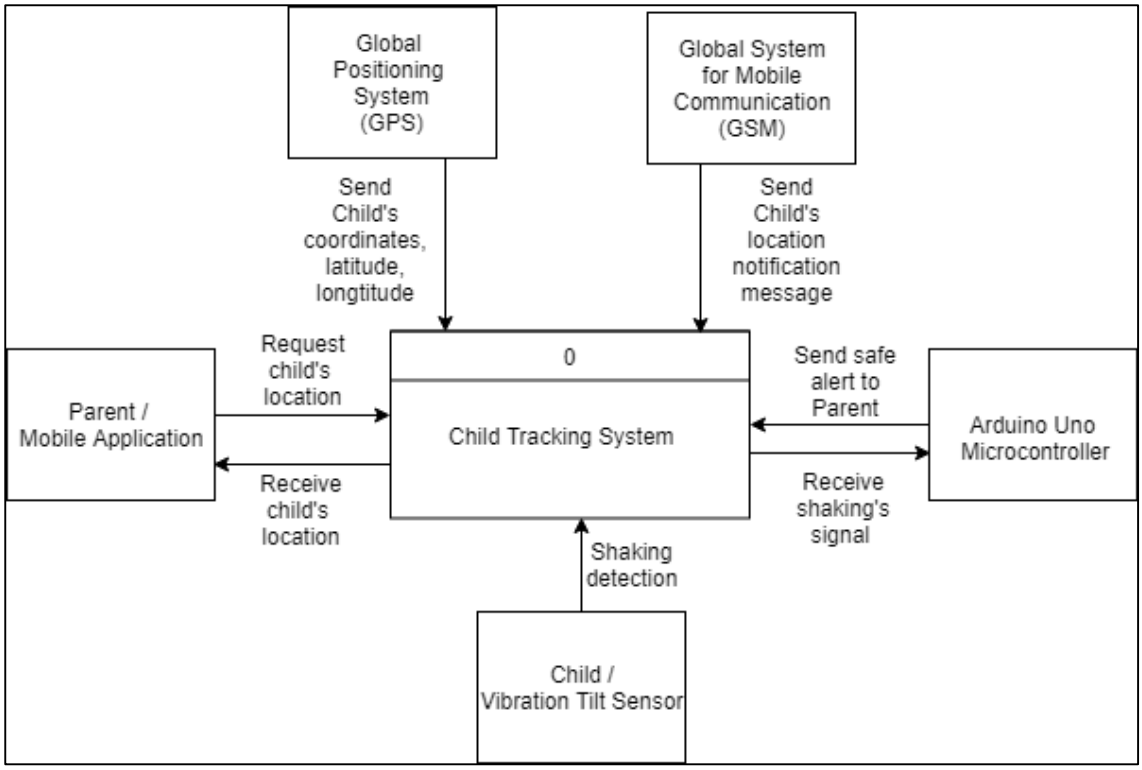

Figure 3.2: Context Diagram for Child Tracking System

According to figure 3.2, Child Tracking System is used by one main user which is parent by using mobile application. Parent can request their child's location in real time by just using the mobile application that can be installed in their mobile phone. The Global Positioning System (GPS) will help to send coordinates of the child's location in latitude and longitude. Then, the Global System for Mobile Communication (GSM) will send the child's location to parent's mobile phone via notification message or SMS. Finally, the parent will immediately receive their child's location through their mobile phone. Apart from that, the vibration tilt sensor which is embedded in the child's smart watch will detect the shaking or struggle of their child to ensure the safety of the child. The vibration tilt sensor will measure the bandwidth of vibration and send shaking's signal to Arduino Uno Microcontroller. Then, the Arduino Uno Microcontroller will send alert message to Parent according to the amount of bandwidth of shaking's signal received from vibration tilt sensor. Hence, the parent would be notified by the condition of their child whether they are safe or not.

3.2.3.2 Use Case Diagram

Use case diagram is a basic chart to show the relationship between the user and the system. There are several function that carried out in the Child Tracking System. Figure 3.3 below shows the interaction between user and the use case in the system.

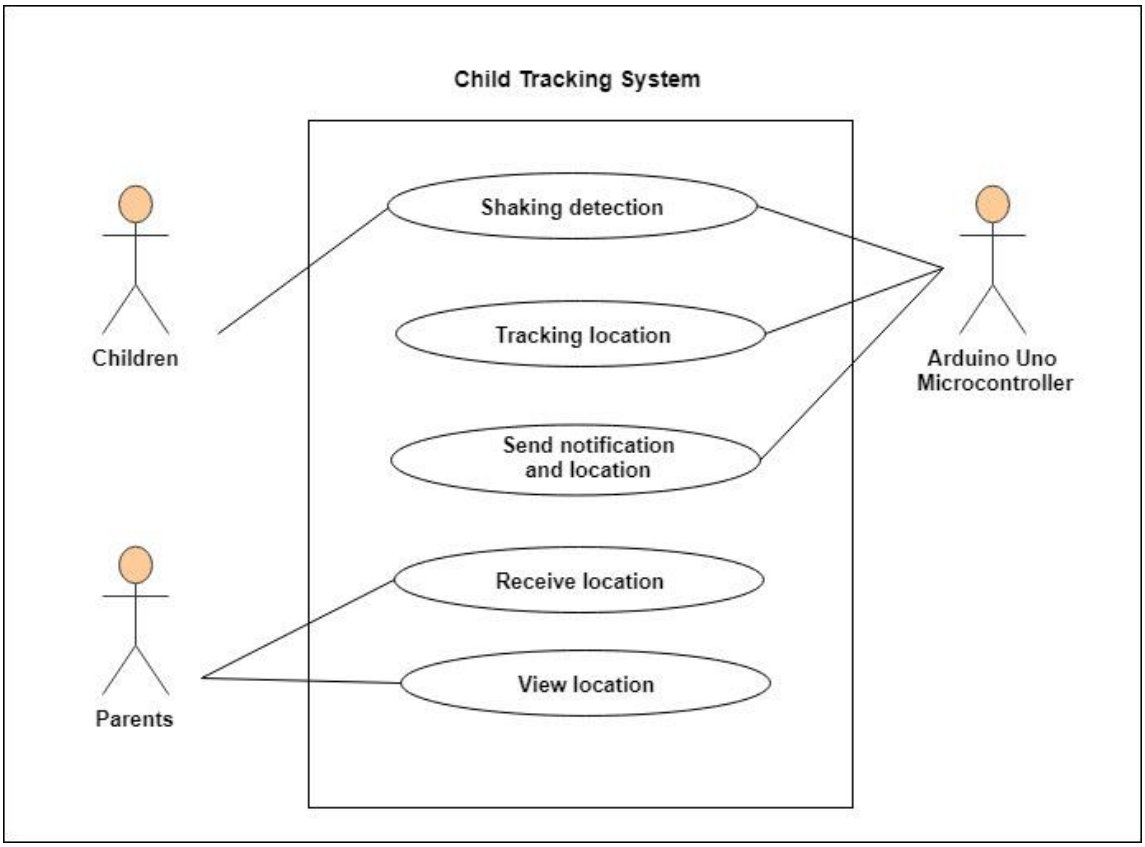

Figure 3.3: Use Case Diagram for Child Tracking System

According to figure 3.3, there are three main actors in this system which is the children, parents and Arduino Uno Microcontroller. Children will wear smart watch that is embedded with vibration tilt sensor which allow the shaking detection. The Arduino Uno Microcontroller will then receive the vibration's signal and send the notification message to parent about the safety condition of their children. Children are also enable to make phone call or video call to their parents in real time communication by just using the smart watch. Meanwhile, parents are able to receive location of their children and view their current location at anywhere and anytime. Parents are also able to make phone call and video call to their children by using the mobile phone. The Arduino Uno Microcontroller enable to do four function which is shacking detection, tracking location and send notification and location.

3.2.3.3 Flowchart

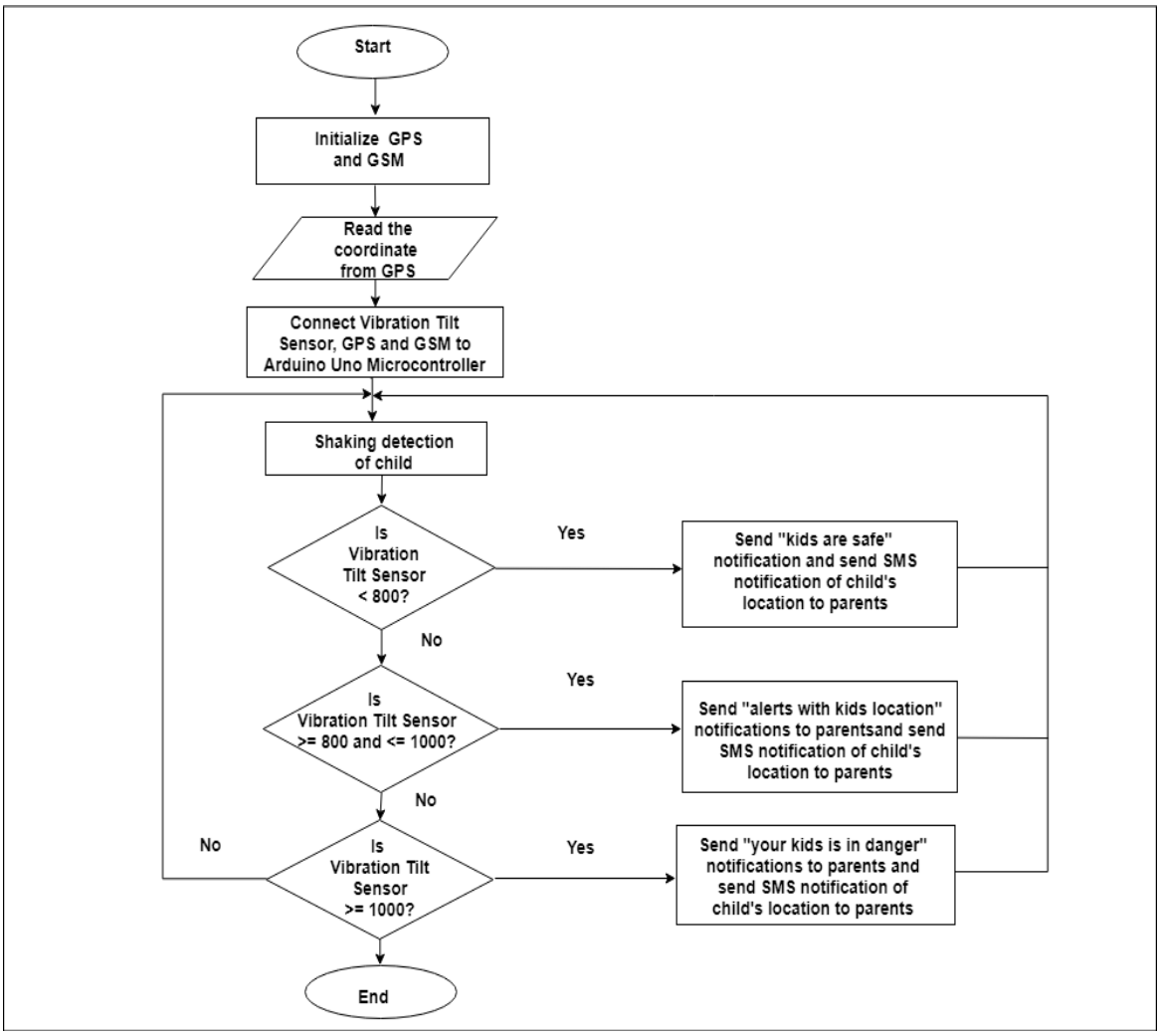

Figure 3.4: Flowchart of Child Tracking System

Figure 3.4 demonstrate the flow chart of the system. Firstly, the flow chart will start by inserting the sim card into the sim tray of Global System for Mobile Communication (GSM) shield. Then, the Global Positioning System (GPS) will initializing the current location of the child and find the coordinates in latitude and longitude. The connection of vibration tilt sensor, GPS and GSM is built on Arduino Uno Microcontroller to determine the status of the system.

The vibration tilt sensor will responsible for shaking detection. If the shaking is detected, then the system will be coded to send a trigger signal to Arduino Uno Microcontroller. Then, if the level of vibration is less than 800 Hz, then the system will send notification message that their kids are safe with the current location of them to the

parents. If the level of vibration is greater and equal to 800 Hz and less and equal to 1000 Hz, then the system will send notification message that the parents need to be alert with their child's location with the current location of them. If the level of vibration is greater and equal to 1000 Hz, then the system will send notification message that their kids are in danger with the current location of them to parents.

3.2.3.4 System Architecture of Child Tracking System

The figure below shows how the design layout of the connection between the Mobile Application and the Arduino Uno Microcontroller. This also illustrates how the data are being transferred between the Mobile Application and Arduino Uno Microcontroller.

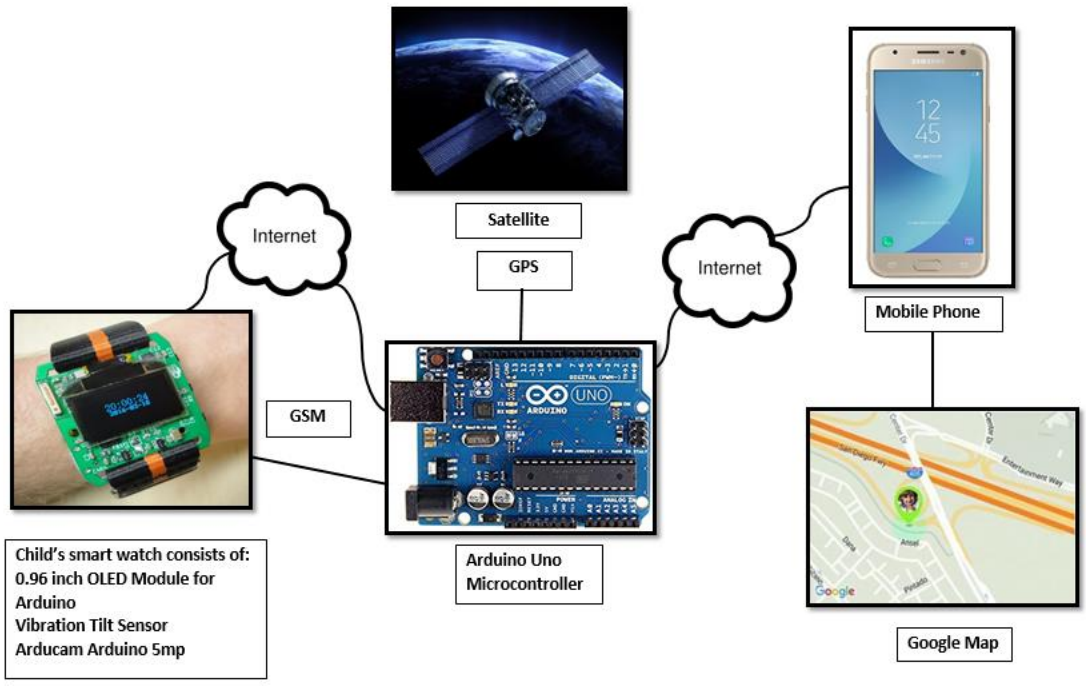

Figure 3.5 System Architecture of Child Tracking System

Basically, based on the figure above, the application works on two modules, first for parents and the second one is for children. Parents need to install the Child Tracking System's mobile application on their mobile phone meanwhile their children just need to wear smart watch which has GPS features and shaking detection features. Parents can view the current location of their child using the Google Map in Child Tracking System's mobile application with the internet connection.

3.2.3.5 Design of Child Tracking System Interfaces

Figure 3.6: Home page of Child Tracking System

Figure 3.6 show home page of Child Tracking System for mobile application. This page consists of title of application, a few text that describe the application's function and a button "Enter" that will link to the next page.

Figure 3.7: Menu page of Child Tracking System

Figure 3.7 show the second page after the Home page which is Menu page of Child Tracking System for mobile application. This page consists of list of menu items which is view current location. User can choose any button from the menu items that will link to the next page.

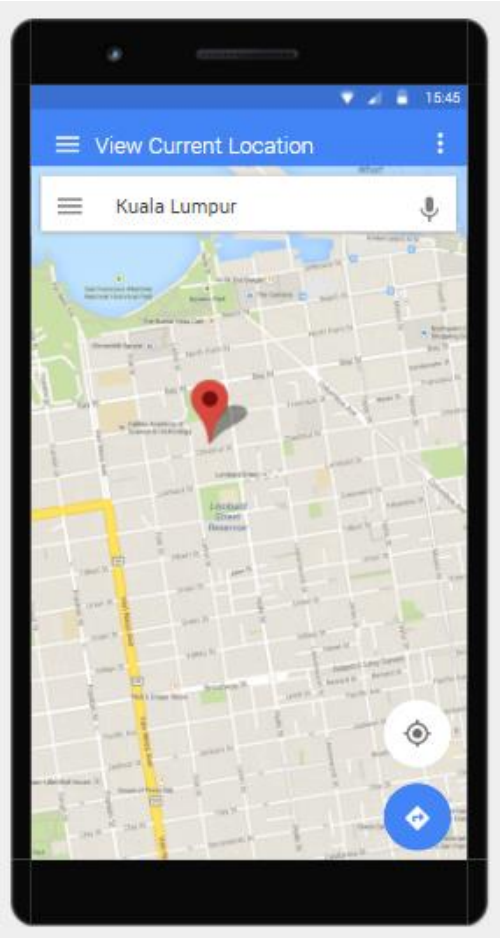

Figure 3.8: View Current Location page of Child Tracking System

Figure 3.8 show View Current Location page of Child Tracking System for mobile application. This page allow user to view the child's current location with the map view. The map view is enable by using the Google Map application.

3.2.4 Construction

In this phase, user design is involved to develop prototype. Various RAD tools are used to building the working prototype of Child Tracking System in hardware development such as the structure or design of the Arduino board with other component and software development such as user interface. Then, the prototype will be checked to ensure the functionality is developed according to user's requirement of the system. If the project client or user is not satisfied, then changes are made to the model and the prototype of the system. This modification process will be continuing until the user is totally satisfied with the product. The prototypes of Child Tracking System will also be made for convenience of the user to know the flow of this system.

3.2.5 Cutover

In this phase, it will resemble the final tasks in the Software Development Life Cycle (SDLC) implementation phase. This phase will be including data conversion, system testing, changeover to the new system and user training that is involve in this project. It will every unit or components and ensure that the project meets the client or user's requirements. This phase also includes fixing any errors found in the system testing. Moreover, user acceptance test will also be carried out as an activity in the end of this phase. Then, after the system are tested and it is free from any error, the system can be used by the client or user. Finally, the Child Tracking System is built, implemented and arranged in better operation which can be used by the client.

3.3 Hardware and Software Requirement

This part will discuss about the list of hardware and software that are needed from the Planning Phase until Cutover Phase in order to complete the Child Tracking System.

3.3.1 Hardware Requirement

Table 3.2 shows the hardware items that are being used throughout the phases to develop the project.

Table 3.2 Hardware Requirement

Num.	Item	Quantity	Description
1.	Arduino Uno Microcontroller	1	As a microcontroller of the system.
2.	GPS Module GY-NEO6MV2	1	To provide location information with latitude and longitude.
3.	SIM900 GPRS/ GSM Shield	1	Provide SMS notification services.
4.	Vibration Tilt Sensor	1	To detect the struggle from the device.
5.	0.96 inch OLED Module for Arduino	1	To display information for smart watch of children.
6.	Arducam Arduino 5mp	1	As a platform to capture picture and video calling.
7.	Breadboard	1	Provide board to connect all the devices.
8.	Jumper Wire	40	As connector to each device.
9.	USB connector	1	To connect the Arduino to computer which used to power and program.
10.	GSM Battery	1	To provide power supply for GSM in child's smart watch.
11.	SIM card	1	To receive information from the device.
12.	Laptop	1	To develop the system, prepare the documents and proposals.
13.	Real time Clock	1	To set the real time running for the Arduino board.
14.	Wi-Fi shield	1	To connect Arduino board to the network.
15.	Smartphone	1	To run mobile application to track location of child.

3.3.2 Software Requirement

Table 3.2 below shows the software items that are being used throughout the phases to develop the project.

Table 3.3: Software Requirement

Num.	Item	Description
1.	Microsoft Windows 10	A platform to run the applications required for the documentation and development.
2	Microsoft Office Power Point 2013	To make presentation slide for project.
3.	Microsoft Office Word 2013	A word processor to prepare the documentation.
4.	Microsoft Project 2016	A tool to make Gantt Chart
5.	Arduino Integrate Development Environment (IDE)	A tool to write code for Arduino UNO and compile it in Arduino UNO.
6.	Android Studio Version 2.0	A tool to develop a mobile application.
7.	Justinmind Prototyper 8.1.0	Used for creating design for user interfaces.
8.	Google Chrome web browser	An application to access to the internet to find related information about the project.
9.	Google Maps	Used for Global Positioning (GPS) Function.
10.	Google Drive	Used as a storage to save all the important documents.
11.	Draw.io	A platform to make online diagram.
12.	GitHub	A platform for accessing the pires package sources android library for android studio.

3.3.3 Arduino Uno Microcontroller

Arduino Uno is a microcontroller board based on the ATmega328P. It has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. Furthermore, it includes everything needed to support the microcontroller such as connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started (Store, 2014). Besides, the Arduino Uno Microcontroller is used as a platform to interact with other devices such as GPS module, GSM shield, buttons, sensors and others. It also provides an open source coding and the price is affordable by students. Figure 3.12 shows the Arduino Uno Microcontroller that will be used in this project.

Figure 3.9: Arduino Uno Microcontroller

3.3.4 GPS Module GY-NEO6MV2

This GPS Module GY-NEO6MV2 is designed for Global Positioning System (GPS) application. GPS module is a device that is capable of receiving information from GPS satellites and then to calculate the device's geographical position. Then, by using a suitable software, the device may display the position and directions on a map. The GPS Module GY-NEO6MV2 used TTL level as a communication mode and include with high-gain active antenna. This GPS module also provides a navigational information such as the latitude and longitude of the location.

In order for GPS Module GY-NEO6MV2 to connect with Arduino Uno Microcontroller, it has four connections which are RX, TX, VCC and GND. Besides, it is easy to integrate by using SoftwareSerial on an Arduino Uno or a serial interface on an Arduino Mega (Store, 2014). Figure 3.13 shows the GPS Module GY-NEO6MV2.

Figure 3.10: GPS Module GY-NEO6MV2

3.3.5 SIM900 GPRS/ GSM Shield

The SIM900 GPRS/ GSM Shield is a device that allow send and receive SMS, make and receive phone calls with Arduino. GSM stands for Global System for Mobile Communications and is the global standard for mobile communications. Meanwhile, GPRS stands for General Packet Radio Service which offers a mobile service on the 2G and 3G cellular communication. Furthermore, this GPRS/GSM shield is specifically useful as it allows to connect to the Internet over GPRS network, send and receive SMS, place and receive phone calls ("SIM900 GSM GPRS Shield Arduino Uno: 4 Steps," n.d.).

In this project, the module SIMCom SIM900 was chosen as an interface to communicate with cellular network in Malaysia using GSM network. The SIM900 GPRS/ GSM Shield allows the user to use the GSM cell phone network to receive data from a remote location. Hence, there are three methods that will help to achieve it which is by using Short Message Services (SMS), Service Audio and GPRS Service.

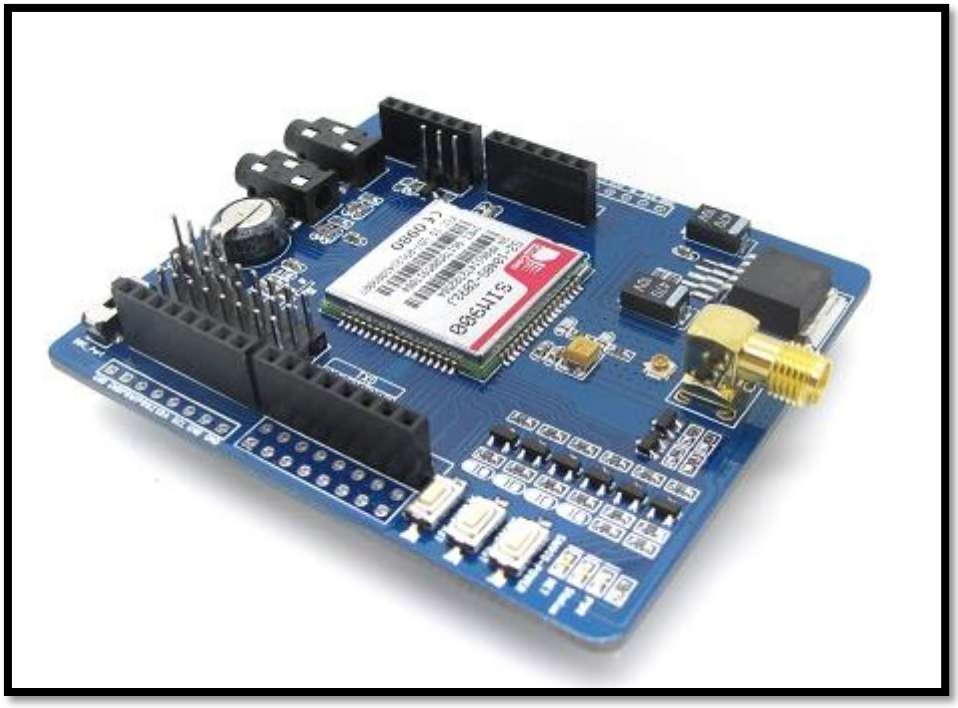

Figure 3.11: SIM900 GPRS/ GSM Shield

3.3.6 Vibration Tilt Sensor

Vibration Tilt Sensor is used for vibration or shaking detection. This sensor has two contact pins. When an external force is acted upon either by movement or vibration, the sensor's two contact pin are closed and contact is made between the two pins. Meanwhile, when the force is removed, the sensor terminals returns back to open contacts. This vibration sensor is commonly used in electronic toys, alarm, domestic appliance, electronic devices, smart home system, tamper alarms on cars and other items.

The tilt sensor module can be connected to Arduino Uno Microcontroller using suitable jumper wires. Firstly, all the power supply lines, VCC and GND of the module need to be connected to 5V and GND of the Arduino Uno Microcontroller respectively. Then, link the digital output (DO) of the module to digital pin 2 (D2) and analog output (AO) to analog input o (Ao) of the Arduino. The whole hardware must be powered by a 9V DC/ USB source through the DC IN/ USB socket of the Arduino board. Ensure that the tilt switch position is keep in upright position ("Arduino Tilt Sensor Experiment," n.d.). In this project, the vibration tilt sensor will be used for shaking detection of the child to ensure their safety.

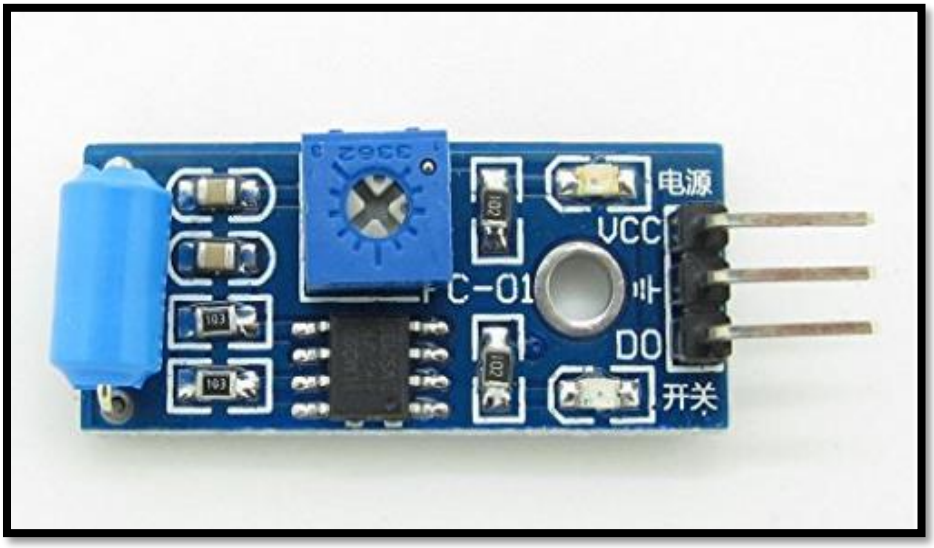

Figure 3.12: Vibration Tilt Sensor

3.3.7 0.96 inch OLED Module for Arduino

0.96 inch OLED Module for Arduino is a miniature display which has 128 x 64 resolution with tree kind of light colour, blue light white light and blue or yellow light. This OLED Module has the display with small dimension which is very suitable for smart watch, function cell phone and smart health device. Besides, the display also makes its own light, so no backlight is required. This reduces the power required to run the OLED which makes the display has such high contrast.

The display connects to Arduino is simple which is just by using only four wires, two wires used for power and another two wires is used for data. The data connection of this display uses I2C communication which means that it communicates with the Arduino using just 2 pins ("Arduino Tilt Sensor Experiment," n.d.). In this project, 0.96 inch OLED Module will be used to display information for smart watch of children. Figure 3.16 shows the 0.96 inch OLED Module for Arduino.

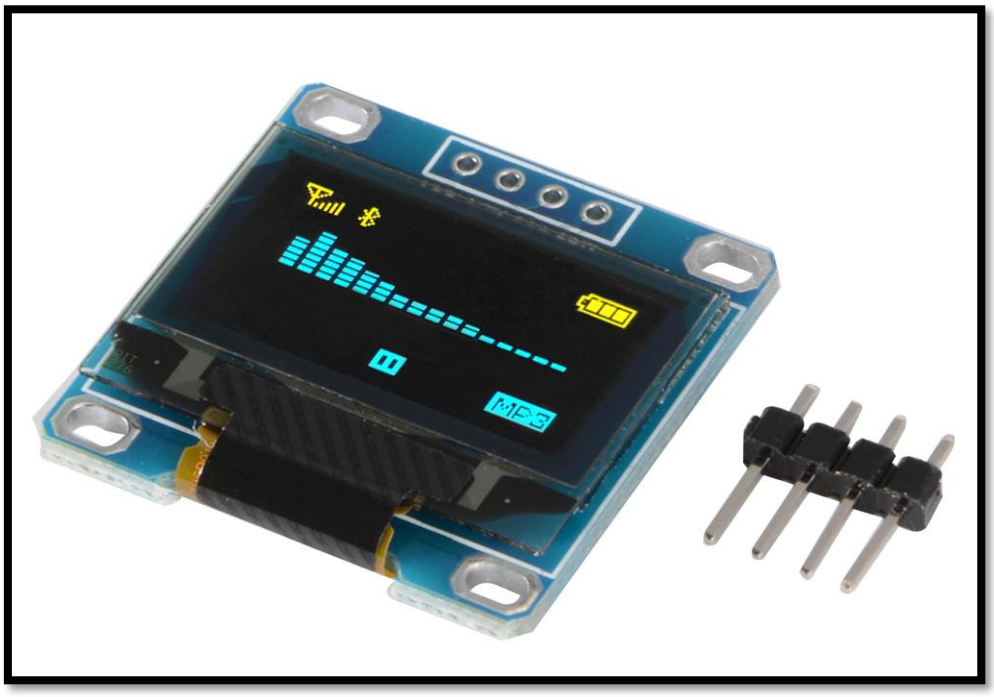

Figure 3.13: 0.96 inch OLED Module for Arduino

3.4 Gantt Chart

The project is conducted within two sessions which is PSM 1 and PSM 2. Based on the development method which is the Rapid Application Development (RAD), requirement planning and application design phases is done throughout PSM 1 session while the construction and cutover phases is done throughout PSM 2 session. The project started from 12/2/2018 and ended on 21/11/2018. The details of the project timeline are showed using the Gantt chart stated in Appendix A.

3.5 Conclusion

All in all, methodology is important in order to perform the good analysis and research to develop the new system. The suitable methodology will guide the developer's team to complete all the task given. In this project, Rapid Application Development (RAD) methodology was chosen because of its adaptabilities and flexibilities. By using this methodology, the system can be updated from time to time. Besides, this methodology is very suitable for small system that require a short development time (Naz & Khan, 2015).

Apart from that, it is crucial to know all the software and hardware used to make sure the system will be developing with the right requirement and complete the project task within the target time.

CHAPTER 4

IMPLEMENTATION, TESTING AND RESULT DISCUSSION

4.1 Introduction

This chapter will discuss about the construction phase of the project. The project will be tested in this phase. The aim of this phase is to prepare the coding for the whole system and create the prototype of the system as a real working system. In this phase, all the configuration system need to be demonstrated which are to construct, develop, build or modified system to become a complete system. In order to build the working prototype of child tracking system, various RAD tools are used in hardware development such as the structure or design of the Arduino board with other component and software development such as user interface. Then, it is checked to verify the functionality developed in order to fulfil the user requirement of the system. This stage will be done when the programming some portion of the framework is effectively kept running with no mistakes or disappointments and physical piece of the framework is finished.

4.2 Model Implementation

This part will clarify in detail, how the project prototype was organized.

4.2.1 Configuration of GPS Module (GY-NEO6MV2)

GPS Module (GY-NEOMV2) functionality is to determine coordinates of the child's location in latitude and longitude. In order for GPS Module GY-NEO6MV2 to connect with Arduino Uno Microcontroller, it has four connections which are RX, TX, VCC and GND. The power supply range of GPS Module (GY-NEOMV2) is between 3V to 5V. In this project, 5V of power supply from Arduino will be used and will be connected to VCC pin of GPS Module. RX connection line of Arduino which is RX = 9

will connect to the TX pin of GPS Module. Next, TX connection line of Arduino which is TX = 10 will connect to the RX pin of GPS Module. Lastly, GND pin of Arduino will connect to GND pin of GPS Module.

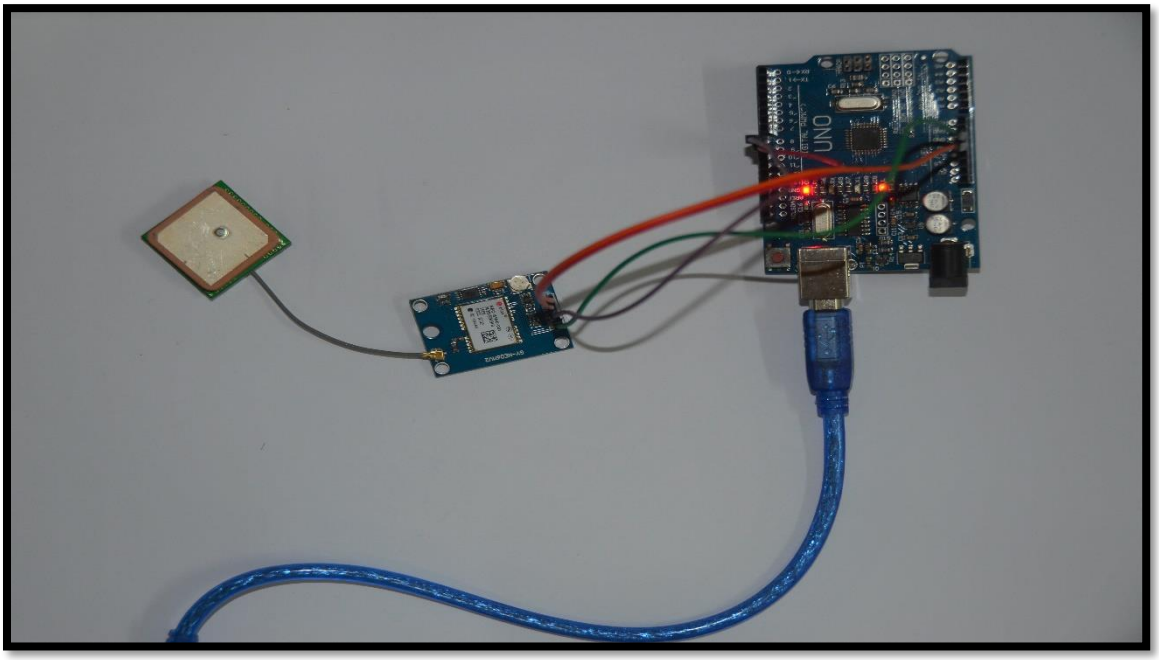

Figure 4.1: GPS Module (GY-NEOMV2)

```
void loop()
 {
   while(serial_connection.available())
    {
       gps.encode(serial_connection.read());
     }
   if(gps.location.isUpdated())
    {
      Serial.println("Satellite Count:");
      Serial.println(gps.satellites.value());
      Serial.println("Latitude:");
      Serial.println(gps.location.lat(), 6);
      Serial.println("Longitude:");
      Serial.println(gps.location.lng(), 6);
      Serial.println("Speed MPH:");
      Serial.println(gps.speed.mph());
      Serial.println("Altitude Feet:");
      Serial.println(gps.altitude.feet());
      Serial.println("");
     }
  }
```

Figure 4.2: Function for GPS Location Detection

4.2.2 Configuration of Vibration Tilt Sensor

Vibration Tilt Sensor functionality is used for vibration or shaking detection. The vibration tilt sensor will measure the bandwidth of vibration and send shaking's signal to Arduino Uno Microcontroller. This sensor will use 5V battery to power the system. It is a high sensitivity vibration switch. The vibration tilt sensor circuit schematic is shown in Figure 4.3.

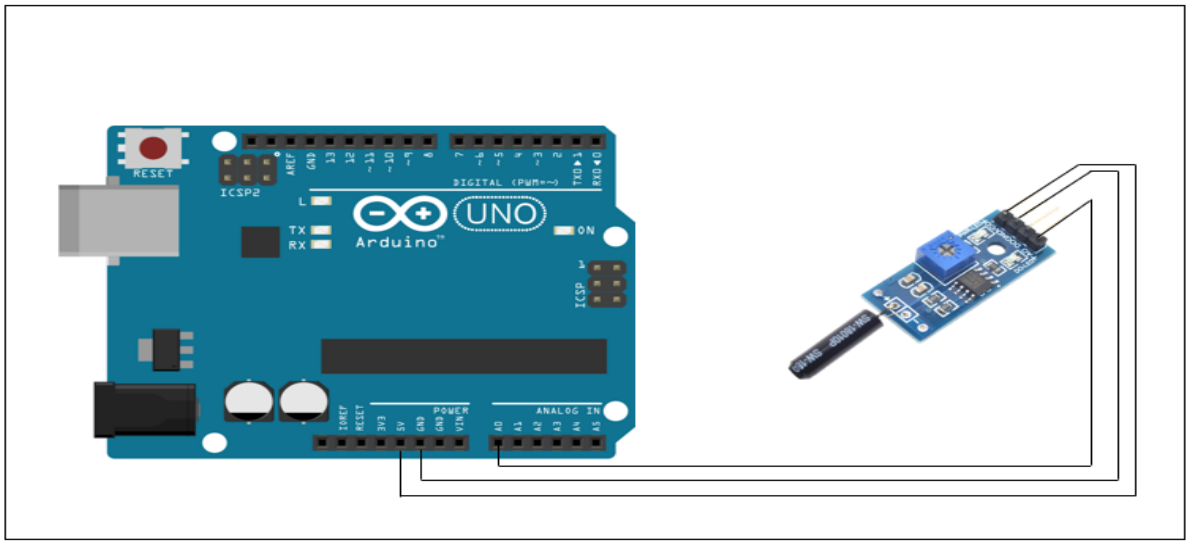

Figure 4.3: Vibration Tilt Sensor Schematic

```
int PathPin = A0;
float sensorValue;
void loop() {
  sensorValue = analogRead(PathPin);
  delay(1000);
  }
  if (gps.location.isUpdated())
  {
    int sensorValue = Serial.parseInt();
    Serial.println("Latitude:");
    Serial.println(gps.location.lat(), 6);
    Serial.println("Longitude:");
    Serial.println(gps.location.lng(), 6);
  }
  else if (sensorValue >=1000 && x<1)
  {
    textDANGER();
    x++;          //For sending only one message
  }
```

Figure 4.4: Function for Vibration Tilt Sensor

4.2.3 Configuration of GSM Shield Sim 900

GSM Shield Sim900 functionality is to send and receive SMS notification. GSM will send the child's location to parent's smart phone via Short Messaging System (SMS). SMS will be received and send by using AT (attention) command. The GSM shield circuit schematic is shown in Figure 4.5.

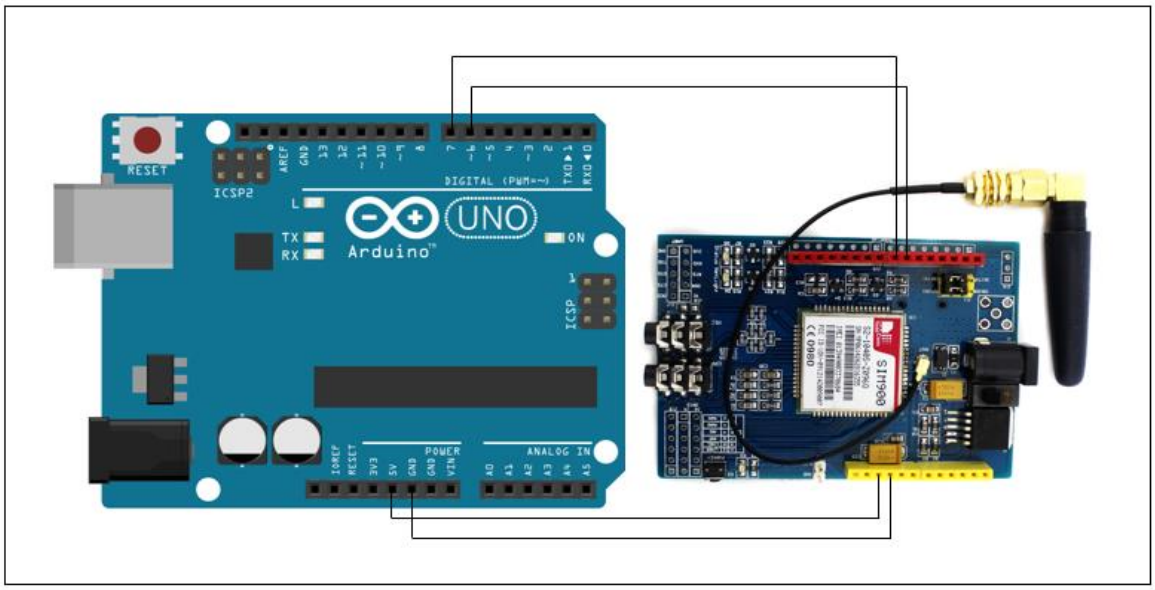

Figure 4.5: GSM Shield Sim900 Schematic

```
void SendTextMessage()
{
  gps.location.lat();
 gps.location.lng();
 SIM900.print("AT+CMGF=1\r");
 delay(100);
 SIM900.println("AT+CMGS = \"+60168590592\"\r");
 delay(100);
 Serial.println("\n");
 SIM900.println("Location:");
 Serial.println("\n");
 SIM900.println("www.google.com.vn/maps/place/");
 SIM900.println(gps.location.lat(), 6);
 SIM900.print(",");
 SIM900.print(gps.location.lng(), 6);
 delay(100);
 SIM900.println((char)26);
 delay(100);
 Serial.println();
 delay(1000);
}
```

Figure 4.6: Function for GSM Shield Sim900

4.2.4 Configuration of Complete System

Figure below shows the configuration of the complete system, Child Tracking System. It is a combination of GPS module, vibration tilt sensor and GSM Shield Sim900. In order to make this system work properly, a sim card must be attached in the GSM Shield Sim900 so that it can send the notification to the parents when the vibration tilt sensor is detecting the shaking or struggle of their child. Meanwhile, the connection between GPS module and Arduino must be close and strong enough to make sure it can detect the current location efficient and precisely.

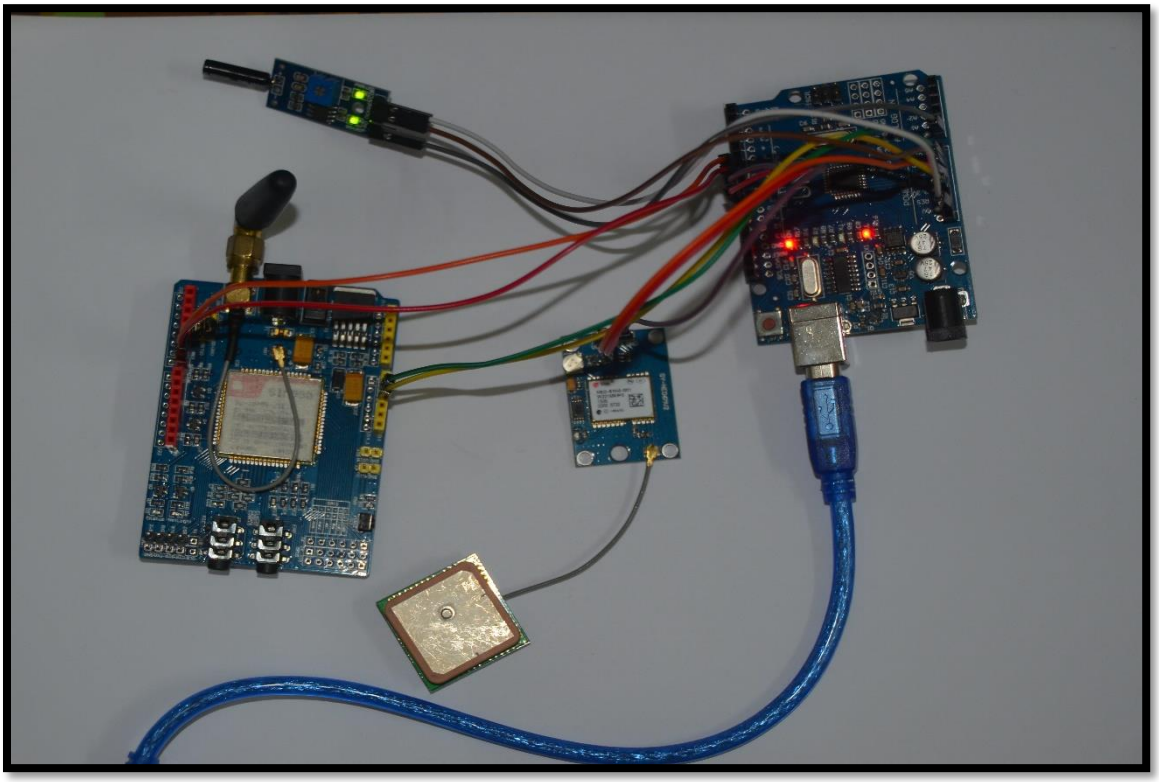

Figure 4.7: Configuration of Child Tracking System

4.3 Coding and Interface

This part will explain in detail on coding and interface of the application. In this project, all the interface for mobile application is developed by using MIT App Inventor.

4.3.1 Child Tracking System Interfaces

Figure 4.8: Main page interface for Child Tracking System

Figure 4.9: Coding blocks of Main page interface for Child Tracking System

Figure 4.10: Menu page interface for Child Tracking System

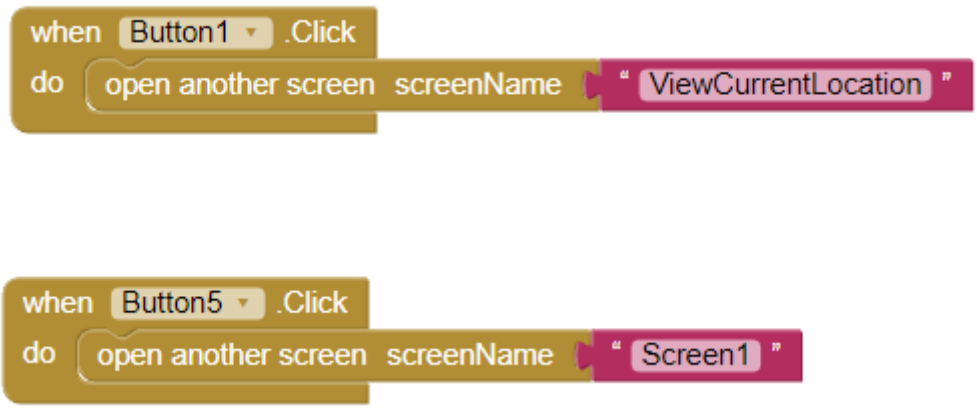

Figure 4.11: Coding blocks of Menu page interface for Child Tracking System

Figure 4.12: View location interface for Child Tracking System

4.4 Testing and Result Discussion

In testing and result discussion, the testing of the vibration detection is by using the vibration tilt sensor. The, the value of the sensor will be captured in the serial monitor in voltage value. Hence, the result is a notification message will be send based on the value of the vibration captured.

4.4.1 Testing the System

In this project, SW-18010P Vibration Tilt Sensor is used to detect the struggle from the watch. If the shaking is detected, then the system will be coded to send a trigger signal to Arduino Uno Microcontroller. Then, if the level of vibration is less than 800 v, then the system will send notification message that their kids are safe with the current location of them to the parents. If the level of vibration is greater and equal to 800 v and less and equal to 1000 v, then the system will send notification message that the parents need to be alert with their child's location with the current location of them. If the level of vibration is greater and equal to 1000 v, then the system will send notification message that their kids are in danger with the current location of them to parents. Table below shows how the testing value of vibration tilt sensor work.

Value Captured in Serial Monitor, v	**Notification**
Sensor Value < 800	Send "Your kids is safe" notification
Sensor Value >= 800 && Sensor Value <=1000	Send "Please be alert with your kids location" notification.
Sensor Value > 1000	Send "Your kids is in danger" notification.

Figure 4.13: Value Captured in Serial Monitor

4.4.1.1 Result for testing Vibration Tilt Sensor

During the test phase, if the sensor read is below than 800, the condition of the kids is safe. If the sensor read range between 800 to 1000, the parents need to alerts with their kids' location. Lastly, if the sensor read greater than 1000, the condition of the kids is considering in danger.

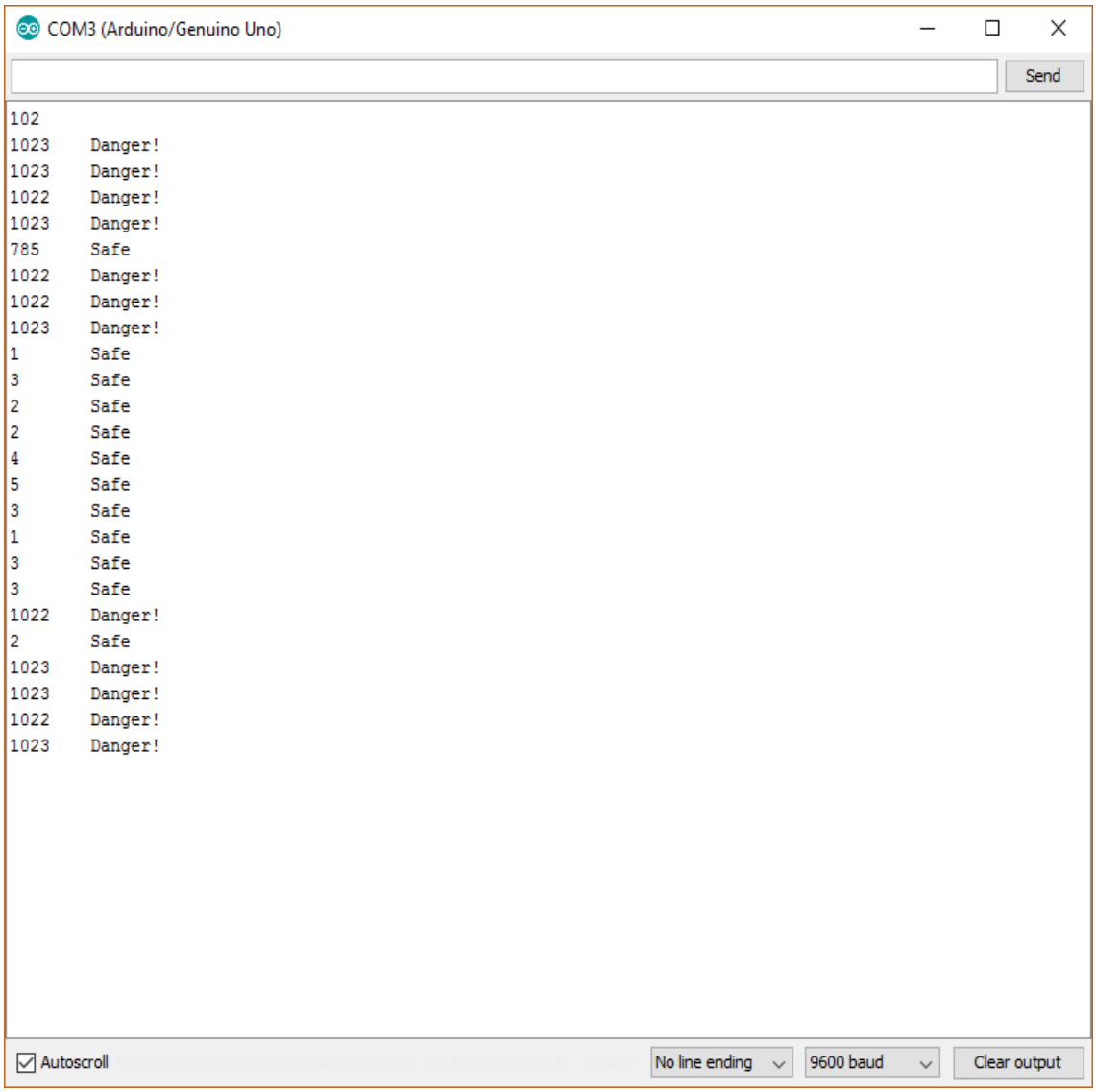

Figure 4.14: Result for testing Vibration Tilt Sensor

4.4.1.2 Result for testing GPS Module (GY-NEO6MV2)

During the test phase, the GPS will track the location of the kids. Below is the example of output of location obtain from the GPS.

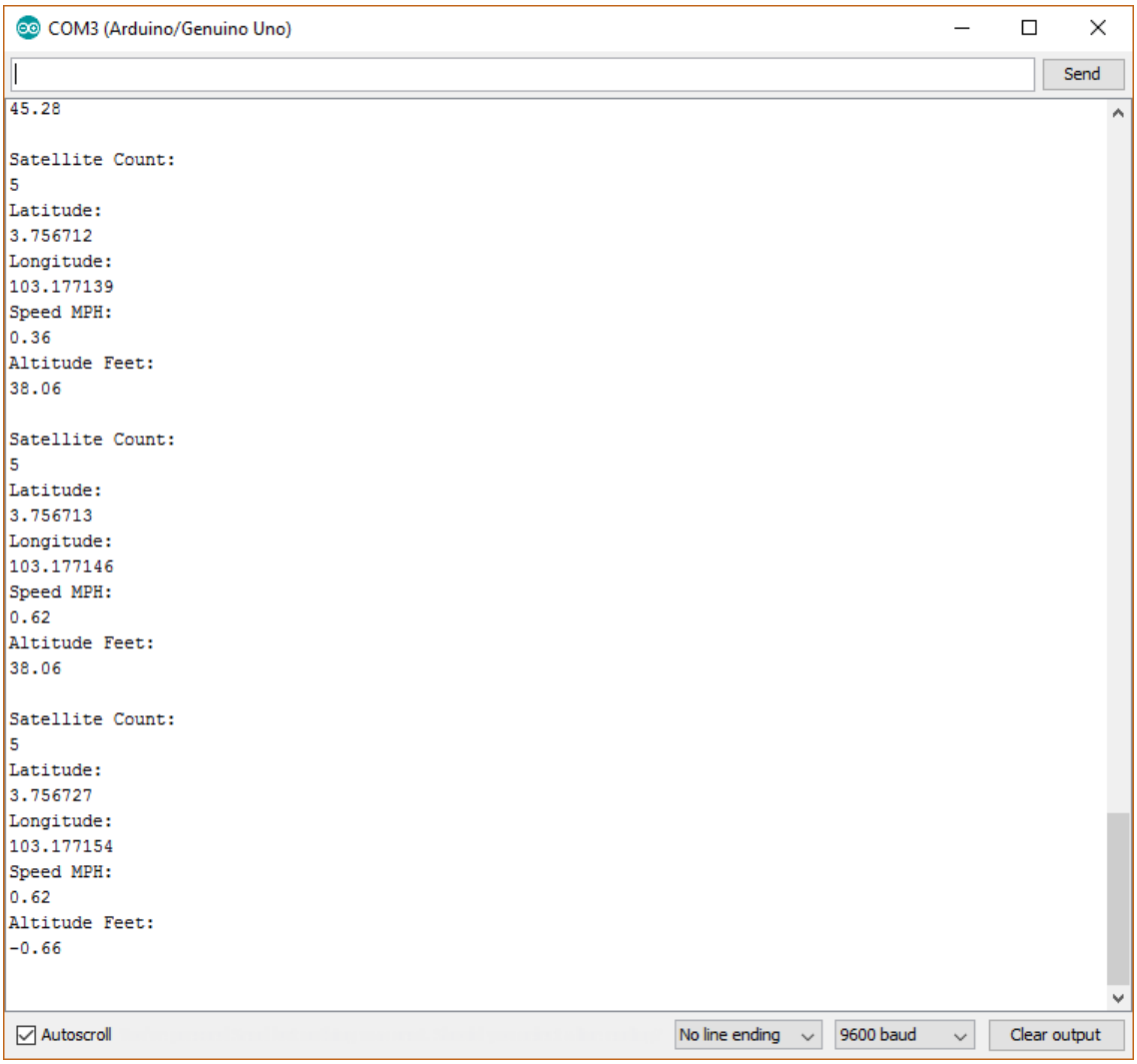

Figure 4.15: Result for testing GPS Module

4.4.1.3 Result for testing whole system

The three figures below show the result of testing the vibration sensor, GPS module and GSM module. The notification will be send to the parents according to the values obtain from the vibration sensor.

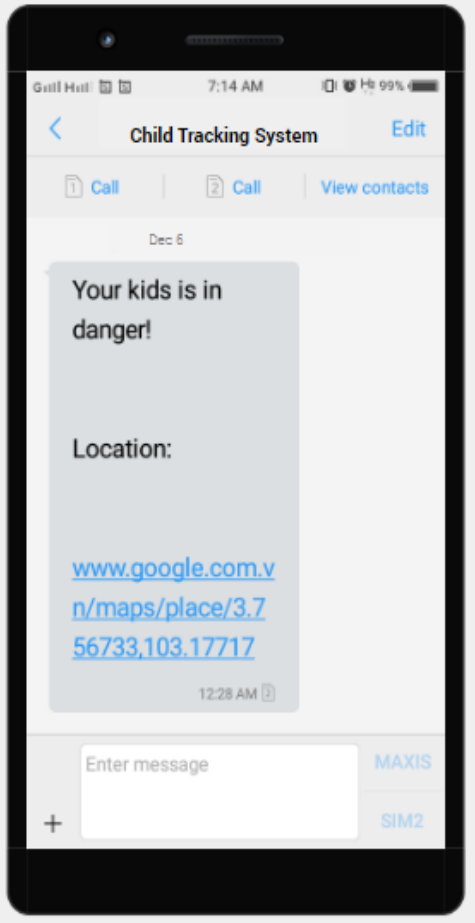

Figure 4.16: Message Example 1

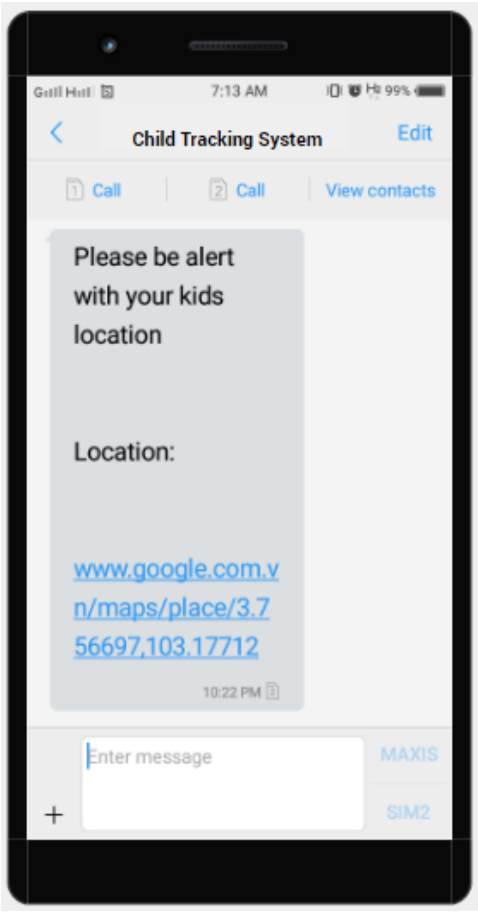

Figure 4.17: Message Example 2

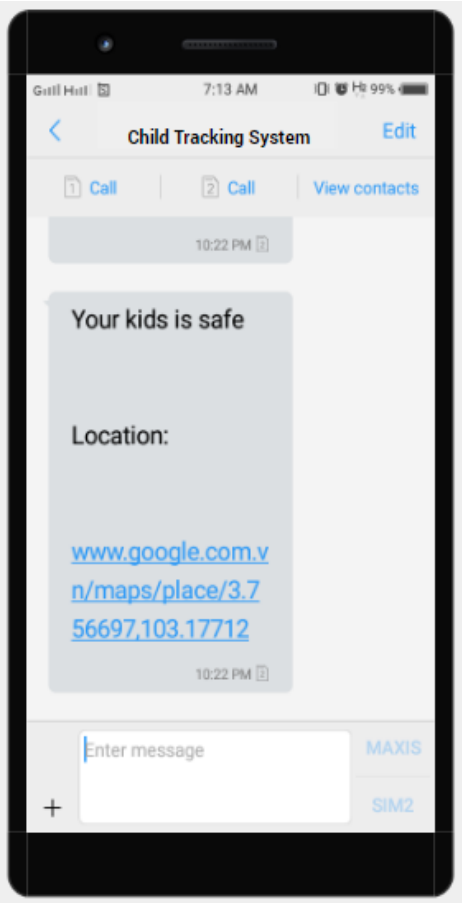

Figure 4.18: Message Example 3

CHAPTER 5

CONCLUSION

5.1 Introduction

This chapter discuss about the general overview of the Child Tracking System using GPS and Arduino. Section 5.2 discuss about the difficulties and constraint found when developing this project. This chapter concludes the project that have been done, which consists of conclusion of the project, methodology and project implementation conclusion and future suggestion and enhancement of project topic.

As for early statement, the objective was achieved which is to develop a prototype of smart watch for child using vibration tilt sensor which is used for shaking detection of child, to design and develop a new system to detect exact children's location with current coordinate by using GPS technology. Besides, this system is made in simple way and easy to use using the mobile application systems that need to be installed by the user and it will be connected to the prototype of smart watch for child.

As for the methodology, method chosen is based on RAD. RAD methodology refers to a development life cycle designed to develop a project in a short time and faster but in higher quality system than the traditional life cycle. This methodology focuses on developing applications in a high speed, high quality and low cost system. There are four phases that involve in RAD which is requirements planning, user design, construction and cutover phase.

5.2 Project Constraint

This section will elaborate about the project constraint. While building up this project, a few limitations were discovered which is the GPS signal took about thirty minutes to get the accurate location. The maximum power that can be support by GPS is only 5V and below.

Apart from that, in earlier development of this project, there is some difficulties in configuring the GSM because of the wrong connection of port in Arduino. GSM also need to be configured properly to the right port of Arduino to make sure it can function well. A sim card need to be attach inside the GSM to allow receive and send SMS with required amount of credit.

Furthermore, the mobile application of this project has limited features which is to view the location. The user can only view from the location send by the SMS which limits the user to view the location of the kids in real time.

5.3 Future Work

There are a few recommendation and enhancement that can be made to improve this project. Firstly, the system can implement another function such as from the watch directly make a call to the parents or enhance additional features to send voice note to the parents as opposed to sending SMS.

Besides, the mobile application can add another feature such as manage safe zones for the kids or maybe save or perhaps spare each history of child area for a previous couple of hours. Hence, the parents can follow their children and anticipate whether their children are protected or not founded on history location.

Moreover, in order to attract kids to wear this watch, some interesting stuffs like camera or games should be implement in this watch. The camera can be utilized to send picture of the children to the parents.

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APPENDIX A
SAMPLE APPENDIX